

XVII. *Notes on the dominant Müllerian group of Butterflies from the Potaro District of British Guiana.* By WILLIAM J. KAYE, F.E.S.

[Read October 3rd, 1906.]

PLATES XXIII—XXVII

At the request of Prof. E. B. Poulton I have undertaken to give some account of the Bionomics of British Guiana insects, especially of the Lepidoptera. The long and interesting paper by Mr. G. A. K. Marshall in the *Transactions* for 1902 has also impressed one that perhaps similar notes from another continent, though in no sense so full and complete, might not only prove of interest but perhaps of value in clearing up some debatable points. For the most part deductions have been made in the present case from the accumulation of specimens and no such experiments as recorded by Mr. Marshall can be given. Dates and conditions of capture have been recorded, and in many instances I am able to give my own observations on the specimens in Nature. Furthermore my collector, Mr. C. B. Roberts, who has been the whole time on the same ground, is able to supply many facts which are of value. It is a little unfortunate that he is not a trained naturalist or his notes might have been much fuller and more complete. The specimens that he has captured are however taken all together so remarkable that the bare list of what has occurred in one particular forest-path, would probably be thought sufficiently interesting. Besides this particular district—a forest road stretching for 16 miles back from the Potaro river about 30 miles above its confluence with the Essequibo—I personally in March, April, May, and early June in 1901, collected in many other districts, but I propose to deal chiefly if not exclusively with the joint captures by Mr. C. B. Roberts and myself made on the Potaro road. The road is more or less a winding track varying from 12 to 15 or even 20 feet wide and is in places on sandy soil, in others gravel, and is crossed with "corduroy"\* for a great part of its length, while a small part is built up with the natural gravel. On either side it

\* "Corduroy" is the term employed for a road made similarly to a railway track, *i. e.* with the small trunks of trees split in half and laid close together with the flat side downwards.

is flanked throughout its entire length with heavy forest containing greenheart, wallaba, and mora, besides a vast number of other less known trees.

The forest itself is dark and gloomy and throughout the greater part of the year excessively damp owing to a superabundant rainfall. The character of the vegetation is always the same as even in the dry season the trees are never otherwise than a fresh green. It is not surprising therefore that practically the whole of the Lepidoptera, excepting of course the several species of *Morpho*, present a very uniform sombre tone of coloration. Even the very fine and brightly-coloured *Heliconius catharinae*, *Heliconius astydamia* and *Heliconius egeria* do not strike one in their surroundings as particularly gaudy, and one is bound largely to admit the assertion of A. H. Thayer in his memoir in Trans. Ent. Soc. 1903, p. 553, that many species we call conspicuous are not really so in their surroundings. It must however have been quite impossible for Nature to have evolved such minutely close resemblance in unrelated groups without the aid of Müllerian mimicry. It is impossible to imagine that say an Erycinid butterfly *Esthemopsis sericina*, should have arrived at the identical colour and markings of a Syntomid moth *Agyrta micilia* purely and simply by the process of syncriptic selection. It is the minutest details in the coloration that dispel such a probability: moreover in certain cases, as Prof. E. B. Poulton has cited, I could definitely state that butterflies settled on most "unsuitable" flowers for their protection. A good example is found in the *Lycorava*,-*Melinæa*,-*Heliconius* group that frequents the white flowers of the plant *Eupatorium macrophyllum*. This becomes a most valuable piece of evidence, as the species frequenting these flowers form one of the most extensive of all the groups that we are in the habit of calling Müllerian. Although this *Lycorava*,-*Melinæa*,-*Heliconius*, etc., group is by far the largest and most dominant, there are many other groups in the region: in fact the vast majority of the individuals belong to one or other of a "coterie" of similarly coloured species. In the *Hesperidæ* there are one or two conspicuous examples of synaposematic coloration, and the *Erycinidæ* offer some examples, and it is only in the *Lycænidæ* that there appears to be an absence of it; this bears out exactly what Prof. Poulton said in the Trans. Ent. Soc. 1902, p. 500. It should however be

noted that the Lycænids here are all very uniformly of a blue shade of colour, and doubtless amongst themselves they offer protection in some sort of way.

By far the most numerous, conspicuous and characteristic group of butterflies is the large Ithomiine, Lycoreane, and Heliconine group. The number of individuals contained within this series, certainly more than equals all the other butterflies to be found in most of the months of the year and probably in every month. This group is composed of the following species in their respective Families and Subfamilies :—

### Family NYMPHALIDÆ.

#### Subfamily ITHOMIINÆ.

##### Genus MELINÆA.

1. *Melinæa mneme*, Linn.
2. *Melinæa crameri*, God. and Salv.
3. *Melinæa egina*, Cram.
4. *Melinæa mnasias*, Hew.

##### Genus MECHANITIS.

1. *Mechanitis pannifera*, Butl.
2. *Mechanitis polymnia*, Linn.

##### Genus CERATINIA.

1. *Ceratinia philidas*, God. and Salv.
2. *Ceratinia euclea*,\* Godt.

#### Subfamily HELICONINÆ.

##### Genus HELICONIUS.

1. *Heliconius numata*, Cram.
2. *Heliconius vetustus*, Butl.
3. *Heliconius silvana*, Cram.
4. *Heliconius eucoma*,† Hüb.

##### Genus EUCIDES.

1. *Eucides nigrofulva*, Kaye.
2. *Eucides isabella*, Cram.
3. *Eucides vibilia*, Godt.

#### Subfamily NYMPHALINÆ.

##### Genus ERESIA.

1. *Eresia eunice*.‡

\* The more transparent *Ceratinia* species, *C. barii* and *C. vallonis*, do not strictly belong to this association.

† ? ab. of *H. numata*.

‡ Accidentally omitted from text.

Family DANAIDÆ.

Subfamily LYCOREANÆ.

Genus LYCOREA.

1. *Lycorea ceres*, Cram.
2. *Lycorea pasinuntia*, Cram.

Family ERYCINIDÆ.

Subfamily LEMONIINÆ.

Genus STALACTIS.

1. *Stalactis calliope*, Linn.

Supplementary species belonging to the group but occurring in other localities and not yet detected from the Potaro:—

Family NYMPHALIDÆ.

Subfamily ITHOMIINÆ.

*Tithorea harmonia*, Cram. = *T. megara*, Doub. Hew. *nc.*  
Godt.

Subfamily NYMPHALINÆ.

*Protogonius hippona*, Fab. (true).

Family PIERIDÆ.

*Dismorphia amphione*.

Of all these there is no doubt whatever that the several species of *Melinæa* are the models to which all the other species are converging. *Melinæa mneme* at the present time occurs in prodigious numbers. From March to May and from September to December inclusive (these approximating to the two dry seasons), it is almost invariably to be found sitting upon the white flowers of *Eupatorium macrophyllum* wherever that plant is found growing. In much lesser numbers *Melinæa crameri* is to be found. *Melinæa egina* is rather more plentiful than *M. crameri*, yet a very long way from being as common as *M. mneme*. Of the fourth *Melinæa* there is little to be recorded; it is a single straggler that was taken on March 17th, 1905, and is either *Melinæa mnasius* or a closely



allied undescribed species. There must be much speculation as to whether *M. mneme* or *M. crameri* commenced to draw the many other species to them in coloration and pattern. *Melinæa mneme* is a strong variant in both fore- and hind-wings while *M. crameri* is very constant above and only as a very rare aberration is a form found with the black of the hind-wing divided by the ground colour so as to form a band. On the under-side, however, there is considerably more variation. The latter species, owing to its comparative constancy, must be looked upon as older than *M. mneme*, a very variable and apparently unstable species. It is however certain that if *M. crameri* was first in the field, *M. mneme* must have entered soon after, for many of the associated species of other genera follow *M. mneme* to a greater extent than *M. crameri*.

In fact *M. mneme* must have been far more potent than *M. crameri*, and the strong variability must have been a great factor in drawing so many different species to the association. Of *M. egina* there is every reason to suppose that it became a fixed and well-defined species early in the history of the group, for we find only one other species closely following it, and that also is a usually very constant species, *Heliconius silvana*. It should here be mentioned however that two specimens of *Heliconius* have been caught, one in March 1905, the other without date, which appear to be aberrations of *H. silvana* with a distinct transverse black band to the hind-wing. These undoubtedly point to a not very distant genetic relationship with *Heliconius numata*.

Unquestionably the closest "pairs" are the *Melinæa* with *Heliconius* species. *Mechanitis* follows them very closely with *Lycorea* also. While *Eueides*, *Ceratinia* and *Stalactis*, in the order named, diverge more and more from the protected pattern. The identical pattern and colour in some of the forms of *Heliconius numata* to *M. mneme* is remarkable, as in the Potaro district the *Heliconius* is apparently never abundant, rarely even really common. I have only 32 specimens, and this represents the whole take. The series is most remarkable for the very extensive variation, some having a narrowly barred hind-wing, others having almost the whole of the hind-wing black except for the costal portion. The *Lycoreas* are certainly more abundant, while the *Mechanitis* species, both *pannifera* and *polymnia*, occur in large numbers. Of

the *Eueides* species the new *E. nigrofulva* has turned up twenty-four times to the twice only of the usually common *E. isabella*. *Ceratinia philidas* is probably only just beginning to be influenced by the group generally, and comparatively few specimens have been taken, in fact one only from the district proper.

The following table will show at a glance the adherents to each *Melinæa*, though doubtless the stress is a very complicated one, and inclined to form a general uniform pattern in the long run, rather than four.

The numbers under each species show the numerical quantity, actual or estimated.

LYCOREA.	MELINÆA.	HELICONIUS.	MECHANITIS.	EUEIDES.	CERATINIA.	STALACTIS.
<i>ceres</i> 30	<i>mneme</i> * 400	<i>numata</i> 33	<i>pannijera</i> 80	<i>nigrofulva</i> 24	<i>philidas</i> † 1	<i>calliope</i> 1
<i>pasinuntia</i> 40	<i>crameri</i> 40	<i>vetustus</i> 8	—	—	—	—
—	<i>egina</i> 70	<i>silvana</i> 4	—	—	—	—
—	<i>mnasius</i> 1	—	—	—	<i>cuctea</i> † 50	—
—	* <i>mneme</i> { extreme { banded 400	<i>numata</i> { extreme { banded 4	<i>polymnia</i> 700	<i>isabella</i> 2	—	—
		<i>eucoma</i> 1		<i>vibilia</i> 1		

Some of the above large numbers are estimated only. A trained collector might have detected many more specimens of some of the apparently rare species.

The result of a single day's catch recorded by Professor E. B. Poulton, p. liv-lvi, Trans. Ent. Soc. 1903, fairly well upholds the proportion of the various species. Mr. Roberts has been collecting for me for over four years, and my own three months brings the period up to four and a half years, so it must now be tolerably certain that we know all the species of the group and approximately the proportion of each one to one another.

This is a matter of very great interest, and it shows how the *Ceratinia* may obtain protection doubly—(1) when fresh by conforming to the main group, and (2) when it is worn and of a different appearance by being then mistaken for one of another group of species, a group composed of species of *Napeogenes*, *Ceratinia* and *Sais*, etc.

Although *Melinæa mneme* is nearly always present when

\* Collector stopped catching this species. He could doubtless have taken several thousand.

† See under *Ceratinia*, p. 421.

a collection of these brown and black insects is found on the *Eupatorium* flowers, it is not so invariably. On May 14th, 1901, I remember being disappointed (from the collector's point of view), in coming upon a bush where there were only *Mechanitis polymnia* and *Ceratinia euclea* (*C. philidas* and *C. bendis*) present. Such a case as this clearly shows the value it is to these members to have been brought into harmony with the colours of the dominant *Melinæa mneme*. As although these species are only commencing to conform to the main colouring of the model they are able even among themselves to alight on these flowers and be comparatively immune from danger. It would have been interesting had every specimen of *Melinæa mneme* been retained to see the accurate proportions of the different forms. I have actually kept 70 set specimens, and these are divided up as follows:—

*Melinæa mneme.*

Hind-wing distinctly banded	40 = 57 %	}	Upper-side and Under-side
Hind-wing obscurely banded	22 = 31½%		
Hind-wing with band obliterated	8 = 11½%		

Thus only 1 in 9 is heavily black, and this I have more than once verified to be the approximate percentage.

A further interesting phase of variation is the presence or absence of the red marks just before the yellow apical band on fore-wing. The specimens give these figures:—

	UPPER-SIDE.	UNDER-SIDE.
Fore-wing with large red spots or band before yellow apical band . . . . .	12 = 17%	50 = 71%
Fore-wing with faint or greatly suffused spots . . . . .	40 = 57%	20 = 29%
Fore-wing with red spots, band obliterated, or nearly so . . . . .	18 = 26%	—

These comparative figures are of great interest, as although this species is so dominant in point of numbers, the influence it exerts with its dark forms is very small indeed compared with that of its banded forms. It therefore becomes tolerably clear that the allied *Melinæa*,—*erameri*—which, although not nearly such a common species, but has a very constant black pattern, must have acted very strongly to create the powerful darkening tendency in the hind-wing.

*Melinæa erameri.*

Of the 28 specimens retained of this species there are the following proportions with regard to the dark area in the hind-wing:—

	UPPER-SIDE.	UNDER-SIDE.
Hind-wing without a band . . .	27 = 96 %	21 = 75 %
Hind-wing with a band . . .	1 = 4 %	7 = 25 %
	28	28

The single specimen that shows a band above only shows it very indistinctly, but the seven that show banding beneath have it well defined, three of them show it particularly well, yet on the upper-side it is hardly discernible. A specimen in the Hope Collection at Oxford shows a very distinct band on the upper-side and this came from the same locality and was caught on August 28th, 1903. Seven other specimens were captured on the same day, but all of these were unbanded. It should be noted that this presence of a band on the under-side only, while the upper-side shows no sign of it is particularly instructive and interesting as it shows that selection on the wing and selection at rest are two different factors; moreover, as it will be shown later, the under-side shows more general agreement in the various members of the group taken as a whole.

The proportions of the spotted to non-spotted, with reddish, before the yellow apical band is most striking, especially when compared with the same on the under-side.

	UPPER-SIDE.	UNDER-SIDE.
Fore-wing with distinct red marks before yellow apical band . . . . .	1 = 5 %	15* = 54 %
Fore-wing with faint red marks . . . . .	1 = 5 %	13 = 46 %
Fore-wing without any red marks	26 = 90 %	0 = —
	28	28

\* These show the spots coalesced into a band.

It appears evident from the specimens that the banding of the hind-wing and the presence of the red marks before the apex of fore-wing go together. It is also significant that these specimens have been secured in one or other of the two dry seasons. My own specimen, with an indication of a band in the hind-wing, has also the red marks before apex and was taken on March 27th, 1905, the end of the short dry season. Professor E. B. Poulton's banded specimen has also red marks before apex and was taken on August 28th, 1903, the early part of the long dry season.

In view of the great interest attached to this species as to whether it is the centre of the association of the darkened hind-winged insects, it may be useful here to look at the range of the insect. From the limited material available it seems certainly to be most plentiful in British Guiana. It occurs in the Berbice district adjoining Surinam, and from the only two specimens seen from there one shows a tendency to banding above and strongly below, the other is normal, both have indications of red apical marks on upper-side and strongly developed beneath. Six specimens originally in the Godman and Salvin collection now at South Kensington are labelled Roraima. This must mean somewhere in the Roraima district and not the mountain itself, which is bare rock and out of the Forest region. None of these six are at all banded, either *above or below*, and only one shows any apical marks, and that is only weakly and on the under-side. These six specimens are therefore interesting as suggesting a more extreme dark form away back in the interior of the country. A single specimen has the label "Bartica," a place 40 miles in from the mouth of the Essequibo, and I myself took it there, though only singly. The only locality outside of British Guiana that I have been able to discover is a specimen with a label "Colombia," which like the Roraima specimen is now in South Kensington, but originally in the Godman and Salvin collection. Were it not that all insects in the latter collection have been set up and labelled with the greatest care one would be inclined to discredit the locality. The specimen is a very interesting one. It is strongly banded below, and both above and below has exceptionally strong red apical marks.

Of the other two *Melinæa* species there is little variation to record. *Melinæa egina* is extremely constant on the

upper-side, but again on the under-side there is a most interesting minor piece of variation. It is that there are indications of the formation of a black patch in the centre of the wing by the presence of a long black streak between veins 6 and 7 extending inwards towards base of wing. From 32 specimens examined the following are the tabulated results:—

Under-side with black streak well developed	6 = 19 %
Under-side with black streak slightly developed	14 = 44 %
Under-side without black streak	12 = 37 %
	32

Thus no less than 63 % show some slight development towards the pattern of *Melinæa crameri* on the under-side.

The other *Melinæa*, *M. mnasias*, is only represented by a single specimen and is probably only a wanderer to the Potaro district, its home being further south on the Amazons. As a link with the *Ceratinias* it is extraordinarily close, and indeed when sitting with closed wings would be even passed over by a skilled collector, so alike is it to a large *Ceratinia euclea*.

*Mechanitis pannifera.*

This is a most variable species and is very common. The ♀ is apparently quite rare compared to the male as I find I have only three in a series of 56 examples. The likeness however of these females, and one in particular, to the darkest forms of *Melinæa mneme* is extraordinary, for not only is the pattern and marking so close but the greatly enlarged size give the insect a look much more in general like the *Melinæas* than the smaller and narrower *Mechanitis* species.

The 56 specimens divide up as follows:—

	UPPER-SIDE.	UNDER-SIDE.
Hind-wing with a well-defined band . . . . .	6 = 10 %	18 = 32 %
Hind-wing with the band partly obscured . . . . .	26 = 46 %	35 = 63 %
Hind-wing with the band wholly obscured . . . . .	24 = 44 %	3 = 5 %
	56	56



It will be noticed there are only three examples exhibiting a wholly obscured band on the under-side. Two of these are of males and one a female. All three have the extreme dark upper-side as well. Those put in the "partly obscured" category are examples showing a great contraction of the fulvous band by an extension of the black inwards from the outer margin. It, again, in this species is evident that on the under-side a wholly black area is the exception and not the rule while on the upper-side nearly half (44%) the individuals are of the extreme black form. Again, looked at from another point of view there are no less than 95% showing some sort of banding on the under-side, while on the upper-side there are only 56%, and of these only 10% that are well banded.

*Mechanitis polymnia.*

This species, which in point of numbers comes next to *Melinava mneme*, is here as elsewhere a very constant one. I have estimated that at least 700 specimens have passed through my hands and I have detected only one example that showed any tendency towards a darkening of the hind-wing. This individual, a female, was taken on March 14th, 1905. On the upper-side the whole of the ground colour is darker and in the hind-wing the central black band and the black marginal band are considerably extended so that at the anal angle and near vein 5 these just meet. On the under-side of the hind-wing there is an even greater amount of black scaling. The costal band is increased in width in addition to the central and marginal bands, while the latter join at several points and between veins 4 and 5 completely coalesce.

There is a specimen that shows a very distinct yellow apical streak just as in the previous species *M. pannifera* but which is quite normal in the size of the band of the hind-wing. It also exhibits an almost complete suppression of the black mark between veins 2 and 3 of the fore-wing, and this also is a much more common phase of variation in the previous species.

*Ceratinia species.*

There yet remain the *Ceratinia species*, which although not very conspicuously within the group nevertheless link up certain other species of *Napeogenes*, *Sais* and *Ceratinia*.

These all group themselves together in a remarkable way, but it is not proposed here to deal with all of them. The *Ceratinia* which above all others conforms to the main group is *Ceratinia philidas*, G. and S. Whether this is a good species or a form of another is open to question. It becomes a matter of importance when one wishes to make a statement of its abundance or otherwise and its distribution through the different months of the year. *C. philidas*, G. and S., is in all probability only an aberrational form of *C. ninonia*, Hibb., and this again links up with intermediates to *C. bendis*, G. and S., and *C. euclea*, Godt. The species should therefore be called *euclea*, and all the different forms are merely aberrations on the Potaro. But the forms doubtless become fixed and definite in different localities. Thus at Roraima the *philidas* form seems predominant, but in Trinidad typical *euclea* occurs alone. *C. ab. philidas* is much more frequent in the ♀ sex. The genitalia of *C. philidas* look hardly different to *C. ninonia*, the former only having a longer clasper, but the genitalia of *C. euclea* and *C. ninonia* are the same. The very transparent look of some *C. ninonia* males is unquestionably due to wear, the scales brushing off in the way that the Hemarine Hawk Moths do. *C. barii*, Bates, is, however, a good species, and is always to be distinguished. Of undoubted *C. philidas* only seven specimens have been secured, but only one on the Potaro.\* None of these show anything very different from the type which has the black central band not joined at any point with the black marginal band. It is of interest to note that the type specimen came from the Sierra de Sta Martha in Colombia. Although hitherto the Potaro district has not produced any very extreme forms there is no reason to suppose that they don't exist, as at Omai lower down the Essequibo some much darker forms have occurred, and I have a specimen from there with a black streak in the cell of the hind-wing and which has a much heavier and wider black central band. But in the National Museum at S. Kensington are two remarkable specimens labelled "Roraima," which have the whole of the lower half of the hind-wing black as in the dark *Lycorca* species and in *Heliconius vetustus*. Further evidence from Roraima supports that adduced from the *Melinæa crameri* that probably there there is to be found a much darker association generally.

\* The specimen mentioned on page 416.

*Heliconidæ.*

Having reviewed the whole of the *Ithomiinæ* of the group one turns to the *Heliconidæ*. The members of this family form much the closest mimics, and the varied series of *Heliconius numata* makes a remarkable "pair" in all its forms to the equally variable *Melinæa mneme*.

The association of all the *Heliconius* species within the group must be very ancient as there is never any great divergence from some one or other of the *Melinæas*. It is a remarkable fact that while there are many other differently coloured *Heliconius* species in the neighbourhood they are never (? absolute) found on the white blossoms of the *Eupatorium*.

Four species of *Heliconius* have occurred that belong to the group. It is possible that one of these, *H. eucoma*, is not distinct from *H. numata*. But it is just probable, if unlikely, that several of the supposed aberrations are really distinct. Thirty-three of what have been all called *H. numata* have occurred. These are tabulated as follows:—

HELICONINÆ—Genus *Heliconius*.

*Heliconius numata*.—Thirty-three specimens received in all.

	UPPER-SIDE.	UNDER-SIDE.
Hind-wing narrowly banded black . . . . .	3* = 9 %	—
Hind-wing widely banded black	19 = 58 %	—
Hind-wing with band almost submerged with outer margin	9 = 27 %	—
Hind-wing with band totally submerged . . . . .	2 = 6 %	—
	33	—

It will be seen that by far the largest percentage have the hind-wing very broadly (but very variably) black banded and that the extreme darkening is quite of rare occurrence, only 6% having been seen from the Potaro District. It is interesting to note that not a single

\* One of these may prove to be a distinct species, having a much narrower wing and a much broader yellow post-median band.

one of the forms shows signs of forming the rounded shape of the black patch conforming to that of *Melinæa erameri*, yet I have six *H. numata* from the Demerara River, and two or three from much lower down the Essequibo, viz. Rockstone and Bartica, which show this in a remarkable way. Two in particular show a great extension of the black inwards about the cell, a phase of variation unknown to me from the Potaro.

The other two species of *Heliconius*, viz. *H. vetustus* and *H. silvana*, have occurred quite sparingly, the latter especially so. *H. vetustus* is here a comparatively constant species, and in the eight specimens secured the black area in the hind-wing is never divided by the ground colour. The only variation of the black area is that in some individuals the black extends nearer the costa, basally giving the appearance of a rounded area, while in others the black area stops short by quite a horizontal line.

*Heliconius vetustus.*

The eight specimens divide up thus:—

Upper-side	{	Black area sharply cut off	. 2 = 25 %
		Black area extended upwards	6 = 75 %
Under-side	{	Black area divided . . . .	2 = 25 %
		Black area undivided . . . .	6 = 75 %

The latter with the rounded black area agree very closely with some of the *H. numata*, especially those (6 % only) in which the black is undivided by the ground colour. But in the case of those that are almost undivided the shape is the same giving an agreement of another 27 %, or 33 % in all of the *H. numata* with this more usual form of *H. vetustus*.

A study of the red sub-apical patches in the fore-wing gives the following interesting result:—

Upper-side of fore-wing	without red markings	before apex	8 = 100 %
Upper-side	,,	with	,,
			0 =
			8
			—
Under-side of fore-wing	without red markings	before apex	7 = 88 %
Under-side	,,	with	,,
			1 = 12 %
			8
			—

The solitary specimen with three red markings has them well developed. The specimen is a ♀, and has the more usual rounded black area to the hind-wing, and it was captured on July 19th, 1904—the height of the rainy season.

*Heliconius silvana*.—The four specimens of this species are of remarkable interest. Two of them bear the usual pattern of black marking on the hind-wing while two show the black area divided by the ground colour, one being a good intermediate. Not one of the four have the white marginal spots developed. The species undoubtedly shows the strong local influence of its relatives, and especially is this to be noted in the two specimens with a banded hind-wing, these conforming with the predominant forms of *Melinæa mneme* and *Heliconius numata*. These banded *H. silvana*, although rare, have been recorded elsewhere. There are two such specimens in the Hewitson collection at South Kensington. One labelled Upper Amazon, and another a much smaller specimen, but more completely banded, from Para. The species is evidently on one of the limits of its distribution or would surely be commoner, especially as elsewhere, such as at Para, it is a very common and plentiful insect.

*Heliconius eucoma*.—A single specimen was secured by Mr. C. B. Roberts in 1902. It differs in no way from the type, and is a mere accidental visitor, apparently to the Potaro region. The home of the species is on the Lower Amazon. The species readily fits in with the group through the more extremely banded forms of *Heliconius numata*.

#### HELICONINÆ, Genus *Eucides*.

Three species of *Eucides* have occurred, *Eucides isabella*, *Eucides vibilia*, and *Eucides nigrofulva*.\* The two former only singly and the last not uncommonly. It is curious that one of the single specimens (that of *E. isabella*) is a common species, while the only species that has occurred at all frequently was found to be an undescribed species. It is this new species that conforms to a considerable extent to the main group, while *E. isabella* (as far as can be ascertained from a single individual) is of the ordinary

\* Vide Ent. 1906, p. 52. Three other species of *Eucides* have occurred belonging to another small family group, *E. lybia*, *E. alipha*, and *E. unifasciatus* (?).



form and shows no special influence of the main group. *Eucides isabella*, it should be mentioned here as elsewhere, strongly retains the pattern of the abundant *Mechanitis polymnia*, and this association is probably so ancient that the two species have had time to become fixed and definite. Both these two latter insects occur over a very wide area, and small variations of climate and environment have apparently little or no effect.

*Eucides nigrofulva.*

Of this newly discovered species twenty-five individuals in all have been secured. No less than twenty-two have been females while but three males have been taken. This may indicate that the males and females have different habits, but it may be simply that the males and females emerging at different times and that when the males were out they were either overlooked for something else or perhaps not looked for at all. This latter explanation seems to be more plausible when one examines the under-sides of the specimens as remarked on later. The series of females shows considerable transition from a moderately heavy-banded hind-wing, tending to fuse with the dark outer margin, to a fairly narrowly-banded form with no trace of fusion.

Of the extreme dark form there are four examples, but in no case is the area between the central band and the dark outer margin uniformly black. The males, as will be seen by a reference to the specimen of the insect, have a very much less dark hind-wing, with the black band far more broken up into spots than is ever found in the female. This difference together with the absence of yellow bands to the fore-wing gives the male sex a very different general appearance above. On the under-side, however, except for size, these differences vanish and there is practically no variation in the whole series of either males or females. This is remarkable testimony to the efficacy of selection when the species is at rest. Not only do male and female closely resemble one another on the under-side, but they with closed wings have a remarkable similarity to the under-side of *Heliconius numata*, and particularly to the less dark individuals of that species. The series of white marginal spots to the hind-wing, the most interesting appearance of a yellow patch of scales beyond



the cell between veins 5 and 7, and three white apical spots on the fore-wing are alike found in both *H. numata* and *E. nigrofulva*, not to mention the general arrangement of bands and colours.

*Eucides isabella* and *Eucides vibilia*.

As already mentioned both of these species have occurred but only singly. *E. isabella* is a perfectly normal example. It is remarkable that on the under-side with the wings closed it is hardly to be distinguished from *E. nigrofulva* except for the smaller sub-apical yellow spots forming a band. The straw-coloured patch of scales between veins 5 and 7 is wanting, and points to a more recent association with the group or at least with *Heliconius numata*.

The example of *Eucides vibilia* is much more removed from the normal and illustrates how this species is assuming a darkened hind-wing above. The black scaling of the marginal band shows an extension inwards towards the cell, and this is quite a special development in this species. The sub-apical straw-coloured spots are smaller than in typical examples and follow the pattern *E. isabella*. It must be confessed that on the under-side this insect has little of the general appearance of the majority of the group. The strong rayed aspect of the hind-wing without any band gives the insect a much more distinct and different-looking appearance. But it cannot be overlooked that the dark suffusion of the hind-wing above is significant of the influence of the more pronounced black hind-winged species, and this like the *Protogonius* is probably a resultant of selection for this end made only on the wing.

FAMILY—*DANAIDÆ*.

Sub-family—*LYCOREANÆ*.

The two members of the family *Danaidæ* both offer remarkable instances of the influences of colour and pattern. The two species are *Lycorea pasinuntia* and *Lycorea ceres*. The former shows the influence of the darkening tendency in the hind-wing much less than the latter, and this is the more remarkable because in other

localities even as close as Venezuela and Trinidad *L. ceres* occurs, and never shows the deep black colour on the hind-wing, while *L. pasinuntia* has its home almost confined to Guiana and yet does not conform to the local influence to so great an extent nor in such a large proportion of the specimens. Both species occur chiefly in the long dry season which usually sets in at the end of August and lasts up to nearly the close of December, but odd specimens may be turned up at most times of the year, and I personally took several of each in May 1901, when the rainy season had begun in earnest a month previously.

As has already been seen with the Ithomiines the darkening of the hind-wing is far more pronounced on the upper-side, in fact on the under-side there is always a well defined area where the dark scales fail to obliterate the band. Tabulated, *Lycorea ceres* works out thus:—

<i>Lycorea ceres.</i>	UPPER-SIDE.	UNDER-SIDE.
Hind-wing distinctly banded	6 = 30 %	18 = 90 %
Hind-wing obscurely banded	12 = 60 %	2 = 10 %
Hind-wing band obliterated	2 = 10 %	0 = —
	20	20

We thus find that on the upper-side the specimens with a wholly and partially obscured band number 70 %, while on the under-side they only number 10 %, while the banded forms claim no less than 90 %, an almost complete reversal of the one to the other.

That this species should vary so in regard to the colouring of the hind-wing is not to be surprised at, but it is very remarkable that the pattern of the fore-wing should remain so constant, as there is never any tendency to the form *atergatis*, such as is so frequently met with in Trinidad, nor is there any tendency to darkening of the fore-wing, such as is frequent in Peru, proving by the latter case that the species is in no need of adopting a more uniformly dark aspect, even though it is able under certain conditions to do so. The interest centring round *Lycorea ceres* must always be considerable. It is a species that occurs in one or other of its forms throughout nearly

the whole of Central and South America with Cuba and Haiti. It is true most of the forms are known as distinct species, but if we only could ascertain where the forms overlapped such as we know *atergatis* and *ceres* overlap in Trinidad, there could be no possible doubt that the species was continuous from Mexico to Southern Brazil and from Peru to Para, and that we should find the forms merging one into another. With such a species as this it should be possible to decide by experiment whether all different climates and different climatic conditions tend to produce different geographical races as we know them, or whether the action of mimicry by selection is sufficient to account for these changes. That such a species should adopt so many tones of colour cannot be, because the forest has such a varying aspect, and that the insect when on the wing is variously concealed. The species in several of its phases (? all) is extremely conspicuous in flight, and in Guiana at least it is very conspicuous at rest on the flowers of *Eupatorium macrophyllum*. This *Eupatorium* is a widely distributed and common plant, and it is quite likely that in other parts of the continent it is frequented by this same *Lycorea* under various guises.

*Lycorea pasinuntia*.

This species is certainly commoner than the previous but its variation is not so considerable. And with regard to the complete darkening of the area of the band in the hind-wing it is a comparatively rare feature.

The variation works out thus with 27 examples :—

<i>Lycorea pasinuntia</i> .	UPPER-SIDE.	UNDER-SIDE.
Hind-wing distinctly banded	18 = 66 %	25 = 93 %
Hind-wing obscurely banded *	6 = 22 %	2 = 7 %
Hind-wing band obliterated †	3 = 11 %	0 = —
	27	27

\* This is the extreme form, but it is not nearly so complete as in *L. ceres*.

† Under this class are placed all those that are not completely banded, but the average is not so great as with *L. ceres*.

Table showing comparative percentages of species exhibiting a large undivided black area on UNDER-SIDE and UPPER-SIDE of hind wing.

		UNDER-SIDE.		UPPER-SIDE.	
ITHOMINE NYMPHALIDÆ.		HELICONINÆ.		LYCOREANE DANADINÆ.	
ERYCINIDÆ.					
Melinae.	Mechanitis.	Ceratinia.	Heliconius.	Eueides.	Lycorea.
<i>crameri</i> 75 % <i>mneme</i> 12 % <i>ejina</i> ———— <i>mnasius</i> ————	<i>pannifera</i> 5 %* <i>polymnia</i> ————	<i>phalidas</i> ———— <i>euclea</i> ————	<i>vetustus</i> 75 % <i>mnemata</i> 3 % <i>silvana</i> ———— <i>eucoma</i> ————	<i>nigrofulva</i> ———— <i>isabella</i> ————  <i>vibilia</i> ————	<i>pasinuntia</i> 1 %* <i>ceres</i> ————
<i>crameri</i> 96 % <i>mneme</i> 12 % <i>ejina</i> ———— <i>mnasius</i> ————	<i>pannifera</i> 44 % <i>polymnia</i> ————	<i>phalidas</i> ———— <i>euclea</i> ————	<i>vetustus</i> 100 % <i>mnemata</i> 6 % <i>silvana</i> 50 % <i>eucoma</i> ————	<i>nigrofulva</i> 8 %† <i>isabella</i> ————  <i>vibilia</i> ————	<i>pasinuntia</i> 11 % <i>ceres</i> 10 %
					<i>calliope</i> ————
					<i>calliope</i> ————

\* The extreme black form still shows slight indication of banding beneath.

† Still showing a trace of banding.

*Tithorea harmonia*, *Protogonius hippona*, and *Dismorphia amphione*. Of these three species that fit into the group but have not yet occurred on the Potaro it is highly probable that the *Tithorea harmonia* remains to be discovered. It has been taken at Aunai, a locality higher up the Essequibo. Two specimens at South Kensington bear Aunai labels, and it is remarkable that both of these show no trace of the darkening of the hind-wing but are of the extreme banded form. One of the specimens exhibits the characteristic red apical markings on the under-side while the other is wholly without them. It seems clear from the material available that Surinam and Cayenne produce the darkest forms of *T. harmonia*, while British Guiana gives the *megara* form which is banded. Cramer's figure of *harmonia* shows the insect on the under-side and gives the heavy black form with only the veins showing of the ground colour. It is however significant that in five specimens from Paramaribo at South Kensington only one shows an unbanded form on the under-side. In this latter form the *Tithorea* fits in much better with the group generally, as it has already been shown how frequently the black area is divided on the under-side even when complete on the upper-side.

*Protogonius hippona* fits in admirably with the group; many of the special characteristics being exceedingly well brought out. The only specimens that I know of and have seen of this species are one from Berbice and two from Cayenne. It is therefore possible that the insect belongs more strictly to the territory known as Dutch and French Guiana, Berbice being conterminous with Surinam although within the British area. The insect is chiefly remarkable in having besides the heavy blackening of the hind-wing a row of very conspicuous large white spots to the margin of the hind-wing, at once recalling the *Lycoreas*, *cercs* and *pasinuntia*. As with all the *Protogonius* species this one is doubly protected in having a cryptic under-side, while on the upper-side it gains protection by similitude to a protected group.

It cannot however here be insisted too strongly that the *Protogonius* proves most conclusively that when it is on the wing it must be the *upper-side* that is seen by its enemies, or else how could such a pattern be evolved independently of the very different pattern of the under-side?

Table showing members of the group that

	JANUARY.	FEBRUARY.	MARCH.	APRIL.	MAY.	JUNE.
ITHOMINE NYMPHALIDÆ.	<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>
	<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>
	<i>M. egina.</i>	<i>M. egina.</i>	<i>M. egina.</i>	<i>M. egina.</i>	<i>M. egina.</i>	—
	—	—	<i>M. mnasius.</i>	—	—	—
	<i>Mech. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifer</i>
	<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>
	<i>C. euclea.</i>	<i>C. euclea.</i>	<i>C. euclea.</i>	<i>C. euclea.</i>	<i>C. euclea.</i>	<i>C. euclea.</i>
—	—	—	—	<i>C. philidas.</i>	—	
HELICONIDÆ.	<i>Hel. vetustus.</i>	<i>H. vetustus.</i>	<i>H. vetustus.</i>	—	<i>H. vetustus.</i>	—
	<i>H. numata.</i>	<i>H. numata.</i>	<i>H. numata.</i>	<i>H. numata.</i>	<i>H. numata.</i>	—
	—	<i>H. silvana.</i>	<i>H. silvana.</i>	—	—	—
	—	—	—	<i>H. eucoma.</i>	—	—
	<i>E. nigrofulva.</i>	—	<i>E. nigrofulva.</i>	<i>E. nigrofulva.</i>	<i>E. nigrofulva.</i>	<i>E. nigrofulva.</i>
LYCOREANE DANAIDÆ.	—	—	—	—	<i>L. pasinuntia.</i>	—
	—	—	—	—	<i>L. cercis.</i>	—
	—	—	<i>S. calliope.</i>	—	—	—



have occurred in each month of the year.

JULY.	AUGUST.	SEPTEMBER.	OCTOBER.	NOVEMBER.	DECEMBER.
<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>	<i>M. mneme.</i>
<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>	<i>M. crameri.</i>
—	<i>M. eginu.</i>	—	—	<i>M. egina.</i>	<i>M. egina.</i>
—	—	—	—	—	—
<i>M. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifera.</i>	<i>M. pannifera.</i>
<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>	<i>M. polymnia.</i>
<i>C. euctea.</i>	<i>C. euctea.</i>	—	—	—	—
—	—	—	—	—	—
—	<i>H. vetustus.</i>	—	—	<i>H. vetustus.</i>	<i>H. vetustus.</i>
<i>H. numata.</i>	—	—	—	<i>H. numata.</i>	<i>H. numata.</i>
—	—	—	—	—	—
—	—	—	—	—	—
—	<i>E. nigrofulva.</i>	—	—	<i>E. nigrofulva.</i>	<i>E. nigrofulva.</i>
—	<i>L. pasinuntia.</i>	—	<i>L. pasinuntia.</i>	<i>L. pasinuntia.</i>	<i>L. pasinuntia.</i>
—	<i>L. ceres.</i>	—	<i>L. ceres.</i>	<i>L. ceres.</i>	<i>L. ceres.</i>
—	—	—	—	—	—

In viewing the group as a whole what is most striking is that there is much closer agreement on the under-side than on the upper-side, and it is quite clear that selection must take place while the insects are resting with their wings folded. It should be convincing to the greatest sceptic that say the red apical marks on the under-side could never run through such a series if selection were made on the wing as is affirmed by all those who implicitly believe in the protective environment theory. What comes out clearly from these investigations is that only two species, *Melinæa crameri* and *Heliconius vetustus*, show a large proportion of specimens with a heavy black under-side. The tendency at the present time is all in favour of a banded under-side. On the upper-side the black development is far more pronounced as *Mechanitis pannifera* joins in with 50 % of its forms dark and *Lycorea ceres* with 40 %. Whatever however may be the real cause of these darkened hind-winged forms so characteristic of the Guiana region it is certain that the forces at work are now not so potent for their development as for the more barred forms. It however may be that the selection for the upper-side made upon the flying specimen is acting much more slowly than upon the sedentary individuals, and this at least seems plausible as it is beyond question that the members of this large group spend the greater part of their time at rest on flower-heads and become so engrossed, that they show no inclination to fly, a collector being able to catch individuals with his fingers as they sit feeding.

## EXPLANATION OF PLATES.

## PLATE XXIII.

Müllerian group of Ithomiine, Lycoreane, Heliconine, and Lemoniine butterflies, showing the darkest forms. The upper- and under-sides of every specimen is shown.

All specimens are from the Potaro River, thirty miles above its confluence with the Essequibo, British Guiana. (Between the eighth and tenth mile from the Potaro, on the road to the gold mines.)

All figures are about  $\frac{3}{8}$  of the natural size.

## FIG. ITHOMIINÆ.

1. *Mechanitis pannifera*, ♂ : captured by C. B. Roberts, Aug. 28th, 1903 : in Hope Dep.
2. *Mechanitis pannifera*, ♀ : captured by C. B. Roberts, about Aug.—Oct. 1901 : in Coll. Kaye.
3. *Mechanitis polymnia*, ♀ : captured by C. B. Roberts, March 14th, 1905 : in Coll. Kaye.
4. *Ceratinia philidas* : captured by W. J. Kaye, May 17th, 1901 : in Coll. Kaye.
5. *Melinæa egina* : captured by C. B. Roberts, Aug. 28th, 1903 : in Hope Dep.
6. *Melinæa crameri* : captured by C. B. Roberts, no date : in Coll. Kaye.
7. *Melinæa mneme* : captured by C. B. Roberts, Aug. 28th, 1903 : in Hope Dep.

The same specimen is represented in Fig. 7, Pl. XXVI.

## LYCOREANÆ.

8. *Lycorea cces* : captured by C. B. Roberts, Nov.—Dec. 1901 : in Coll. Kaye.
9. *Lycorea pasinuntia* : captured by C. B. Roberts, no date : in Coll. Kaye.

## HELICONINÆ.

10. *Heliconius silvana* : captured by C. B. Roberts, March 5th, 1905 : in Coll. Kaye.
11. *Heliconius vetustus* : captured by C. B. Roberts, March 18th, 1905 : in Coll. Kaye.

FIG.

12. *Heliconius numata*: captured by C. B. Roberts, April 2, 1905: in Coll. Kaye.

The same specimen is represented in Fig. 14, Pl. XXVI.

13. *Eueides nigrofulva* ♂: captured by C. B. Roberts, Nov.—Dec. 1902: in Coll. Kaye.

14. *Eueides nigrofulva*, ♀: captured by C. B. Roberts, March 25th, 1905: in Coll. Kaye.

## LEMONIINÆ.

15. *Stalachtis calliope*: captured by C. B. Roberts, March 26th, 1905: in Coll. Kaye.

## PLATES XXIV (UPPER-SIDES) AND XXV (UNDER-SIDES).

Müllerian group of Ithomiine, Lycoreane, and Heliconine butterflies, showing the extreme banded forms.

The specimens represented are the same, and their figures occupy corresponding positions on both plates.

All specimens are from the Potaro River, and all, except those represented in 10 and 14, from thirty miles above its confluence with the Essequibo, British Guiana. (Between the eighth and tenth mile from the Potaro, on the road to the gold mines.) Specimens shown in Figs. 10 and 14 are from Tumatumari, fifteen miles lower down the Potaro river.

All figures are  $\frac{2}{3}$  of the natural size.

## ITHOMIINÆ.

1. *Mechanitis pannifera*, ♂: captured by C. B. Roberts, Sept. 1903: in Coll. Kaye.

2. *Mechanitis polymnia*, ♂: captured by C. B. Roberts, Nov.—Dec. 1901: in Coll. Kaye.

3. *Mechanitis polymnia*, ♀: captured by C. B. Roberts, Sept. 3rd, 1903: in Coll. Kaye.

4. *Ceratinia euclea form ninonia*: captured by Percival, April 3rd, 1904: in Coll. Kaye.

5. *Melinæa crameri*, ♂: captured by C. B. Roberts, Aug. 28th, 1903: in Hope Dep.

6. *Melinæa mneme*, ♂: captured by C. B. Roberts, August 28th, 1903: in Hope Dep.

The same specimen is represented in Fig. 2, Pl. XXVI.

7. *Melinæa mnasius*: captured by C. B. Roberts, March 17th, 1905: in Coll. Kaye.

FIG.

## LYCOREANÆ.

8. *Lycorea ceres* : captured by C. B. Roberts, probably Dec. 1901 or Jan. 1902 : in Hope Dep.

9. *Lycorea pasinuntia* : captured by C. B. Roberts, Oct. 1901 : in Hope Dep.

The same specimen is represented in Fig. 2, Pl. XXVII.

## HELICONINÆ.

10. *Heliconius silvana* ab. *divisus* : captured, in 1904, by G. C. Cole at Tumatumari, Potaro River, fifteen miles above confluence with the Essequibo : in Coll. Kaye.

11. *Heliconius numata* : captured by C. B. Roberts, Feb. 10th, 1905 : in Coll. Kaye.

The same specimen is represented in Fig. 8, Pl. XXVI.

12. *Heliconius eucoma* : captured by C. B. Roberts, about 1902 : in Coll. Kaye.

13. *Eueides nigrofulva*, ♀ : captured by C. B. Roberts, June 30th, 1902 : in Coll. Kaye.

14. *Eueides isabella* : captured, in 1904, by G. C. Cole at Tumatumari (see Fig. 10) : in Coll. Kaye.

## PLATE XXVI.

Series of *Melinæa mneme* and *Heliconius numata*, showing parallel transition from barred to black hind-wings.

All specimens are from the Potaro River, thirty miles above its confluence with the Essequibo, British Guiana. (Between the eighth and tenth mile from the Potaro, on the road to the gold mines.)

All figures are  $\frac{2}{3}$  of the natural size.

1 *Melinæa mneme*, ♂ : captured by C. B. Roberts, Aug. 28th, 1903 : in Hope Dep.

2 *Melinæa mneme*, ♂ : captured by C. B. Roberts, Aug. 28th, 1903 : in Hope Dep.

The same specimen is represented in Fig. 6, Pl. XXIV, XXV.

3 *Melinæa mneme*, ♂ : captured by C. B. Roberts, Aug. 28th, 1903 : in Hope Dep.

4 *Melinæa mneme*, ♂ : captured by C. B. Roberts, Aug. 28th, 1903 : in Hope Dep.

5 *Melinæa mneme*, ♂ : captured by C. B. Roberts, Aug. 29th, 1903 : in Hope Dep.

FIG.

6. *Melinæa mneme*, ♂ : captured by C. B. Roberts, Aug. 28th, 1903 :  
in Hope Dep.
7. *Melinæa mneme*, ♂ : captured by C. B. Roberts, Aug. 28th, 1903 :  
in Hope Dep.  
The same specimen is represented in Fig. 11, Pl. XXIV, XXV.
8. *Heliconius numata* : captured by C. B. Roberts, Feb. 10th, 1905 :  
in Coll. Kaye.
9. *Heliconius numata* : captured by C. B. Roberts, March 3rd, 1905 :  
in Coll. Kaye.
10. *Heliconius numata* : captured by C. B. Roberts, March 4th, 1905 :  
in Coll. Kaye.
11. *Heliconius numata*, captured by C. B. Roberts, Feb. 9th, 1905 :  
in Coll. Kaye.
12. *Heliconius numata* : captured by C. B. Roberts, March 4th, 1905 :  
in Coll. Kaye.
13. *Heliconius numata* : captured by C. B. Roberts, Dec. 9th, 1904 :  
in Coll. Kaye.
14. *Heliconius numata* : captured by C. B. Roberts, April 2nd, 1905 :  
The same specimen is represented in Fig. 12, Pl. XXIII.

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### PLATE XXVII.

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Series of *Lycorea pasinuntia* and *Lycorea cerez*, transition from barred to black hind-wing, showing parallel.

All specimens are from the Potaro River, thirty miles above its confluence with the Essequibo, British Guiana. (Between the eighth and tenth mile from the Potaro on the road to the gold mines.)

All figures are about  $\frac{2}{3}$  of the natural size.

1. *Lycorea pasinuntia*, barred form : captured by C. B. Roberts, Oct. 1901 : in Coll. Kaye.
2. *Lycorea pasinuntia*, darkest barred form : captured by C. B. Roberts, Oct. 1901 : in Hope Dep.  
The same specimen is also figured in Plates XXIV and XXV, Fig. 9.
3. *Lycorea pasinuntia*, intermediate form : captured by C. B. Roberts, Nov.—Dec. 1901 : in Coll. Kaye.
4. *Lycorea pasinuntia*, dark form with faint traces of inner section of pale submarginal band : captured by C. B. Roberts, Nov.—Dec. 1901 : in Coll. Kaye.



FIG.

5. *Lycorea pasinuntia*, dark form with faint trace of inner end of pale submarginal band : captured by C. B. Roberts, Nov.—Dec. 1901 : in Coll. Kaye.
6. *Lycorea pasinuntia*, darkest form : captured by C. B. Roberts in 1901 : in Coll. Kaye.
7. *Lycorea ceres*, barred form : captured by C. B. Roberts, Nov.—Dec. 1901 : in Coll. Kaye.
8. *Lycorea ceres*, darker barred form : captured by C. B. Roberts, Oct. 1901 : in Coll. Kaye.
9. *Lycorea ceres*, median section of pale submarginal band has disappeared : captured by C. B. Roberts, 1901, probably Dec., or 1902, probably Jan. : in Hope Dep.
10. *Lycorea ceres*, more complete disappearance of median section of pale band : captured by C. B. Roberts, 1901, probably Dec., or 1902, probably Jan. : in Hope Dep.
11. *Lycorea ceres*, submarginal bar as in last figure ; the pale discal bar is however far more reduced in the specimen here represented : captured by C. B. Roberts, 1901, probably Dec., or 1902, probably Jan. : in Hope Dep.
12. *Lycorea ceres*, darkest form, only the costal end of the submarginal bar can now be detected, while the inner section of the discal bar is only represented by traces, and its outer part has disappeared. In this important respect *Lycorea ceres* is much in advance of *L. pasinuntia* in the tendency towards progressive darkening : C. B. Roberts, 1901, probably Dec., or 1902, probably Jan. : in Hope Dep.

